

## CLAIM AMENDMENTS

### Claim Amendment Summary

#### Claims pending

- Before this Amendment: Claims 1-50.
- After this Amendment: Claims 1, 3-15, 17-29, 31-43, and 45-50

**Non-Elected, Canceled, or Withdrawn claims:** 2, 16, 30, and 44

**Amended claims:** 1, 15, 29, and 43

**New claims:** none

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### Claims:

**1. (Currently Amended)** A computer-implemented method for related term suggestion, the method comprising:

mining search results via a multi-sense query, wherein the multi-sense query comprises:

determining terms/phrases semantically related to submitted terms/phrases, wherein semantic relationships are discovered by mining a context of the term/phrases to determine meaning;

configuring a threshold frequency of occurrence (FOO) value;

assigning historical queries to high FOO or low FOO based on the configured threshold value;

generating term vectors from the search results associated with a set of high FOO historical queries previously submitted to a search engine; and

generating term clusters as a function of calculated similarity of term vectors;

~~generating term clusters as a function of calculated similarity of term vectors; each term vector being generated from search results associated with a set of high frequency of occurrence (FOO) historical queries previously submitted to a search engine; and~~

responsive to receiving a term/phrase from an entity, evaluating the term/phrase via the multi-sense query in view of terms/phrases in the term clusters to identify one or more related term suggestions, wherein the identifying is based on a combination of FOO and a confidence value; and

returning at least one suggested term list ordered by the combination of FOO and confidence value, wherein multiple suggested term lists are generated when the term/phrase matches terms in more than one term cluster.

**2. (Canceled)**

**3. (Previously presented)** The method of claim 1, and wherein the entity is a computer-program application and/or an end-user.

**4. (Previously presented)** The method of claim 1, further comprising determining the calculated similarity as follows:

$$\text{sim}(q_j, q_k) = \sum_{i=1}^d w_{ij} \cdot w_{ik};$$

wherein  $d$  represents vector dimension,  $q$  represents a query,  $k$  is a dimension index, and wherein weight  $w$  for the  $i^{\text{th}}$  vector's  $j^{\text{th}}$  term is calculated as follows:

$$w_{ij} = TF_{ij} \times \log(N / DF_j); \text{ and}$$

wherein  $TF_{ij}$  represents term frequency,  $N$  is a total number of query terms, and  $DF_j$  is a number of extracted feature records that contain term  $j$ .

**5. (Previously presented)** The method of claim 1, further comprising:

collecting historic query terms from a query log; and

determining ones of the historic query terms with a high FOO.

**6. (Previously presented)** The method of claim 1, further comprising before creating the term clusters:

reducing dimensionality of the term vectors; and

normalizing the term vectors.

**7. (Previously presented)** The method of claim 1, wherein evaluating further comprises:

identifying a match between the term/phrase and term(s)/phrase(s) from one or more term clusters; and

responsive to identifying, generating related term suggestion(s) comprising the term(s)/phrase(s).

**8. (Previously presented)** The method of claim 7, wherein the related term suggestion(s) further comprise for each term/phrase of the term(s)/phrase(s), a frequency of occurrence value indicating a number of times the term/phrase occurs in a set of mined historical queries.

**9. (Previously presented)** A method as recited in claim 1, wherein generating the term clusters further comprises:

sending respective ones of the high FOO historical queries to the search engine to obtain the search results;

extracting features from at least a subset of search results corresponding to the respective ones; and

producing term vectors from the features as a function of term and inverted document frequencies.

**10. (Previously presented)** The method of claim 9, and wherein the features comprise a title, description, and/or context for the respective ones of the high FOO historical query terms.

**11. (Previously presented)** The method of claim 9, and wherein the respective ones comprise top ranked ones of the search results.

**12. (Previously presented)** The method of claim 1, wherein the term clusters are a first set of term clusters, and wherein the method further comprises:

determining that there is no match between the term/phrase and the terms/phrases;  
and

responsive to the determining:

making a second set of term clusters from calculated similarity of term vectors, each term vector being generated from search results associated with a set of low FOO historical queries previously submitted to the search engine; and

evaluating the term/phrase in view of terms/phrases of the second set of term clusters to identify one or more related term suggestions.

**13. (Previously presented)** The method of claim 12, wherein making further comprises:

identifying the low FOO historical queries from historical queries mined from a query log;

sending respective ones of at least a subset of the low FOO historical queries to the search engine to obtain search results;

extracting features from at least a subset of search results; and

producing the term vectors from the features as a function of term and inverted document frequencies.

**14. (Previously presented)** The method of claim 13, and further comprising after clustering:

determining that there is no match between the term/phrase and term(s)/phrase(s) from the first set of term clusters, the first set being based on high FOO historical queries; and

responsive to the determining, identifying a match between the term/phrase and term(s)/phrase(s) from one or more of the second set of term clusters, the second set being based on low FOO historical queries; and

responsive to identifying, generating related term suggestion(s) comprising the term(s)/phrase(s).

**15. (Currently Amended)** A tangible computer-readable data storage medium comprising computer-executable instructions for:

mining search results via a multi-sense query, wherein the multi-sense query comprises:

determining terms/phrases semantically related to submitted terms/phrases, wherein semantic relationships are discovered by mining a context of the term/phrases to determine meaning;

configuring a threshold frequency of occurrence (FOO) value;

assigning historical queries to high FOO or low FOO based on the configured threshold value;

generating term vectors from the search results associated with a set of high FOO historical queries previously submitted to a search engine; and

generating term clusters as a function of calculated similarity of term vectors;

~~generating term clusters as a function of calculated similarity of term vectors, each term vector being generated from search results associated with a set of high frequency of occurrence (FOO) historical queries previously submitted to a search engine; and~~

responsive to receiving a term/phrase from an entity, evaluating the term/phrase via the multi-sense query in view of terms/phrases in the term clusters to identify one or more related term suggestions, wherein the identifying is based on a combination of FOO and a confidence value; and

returning at least one suggested term list ordered by the combination of FOO and confidence value, wherein multiple suggested term lists are generated when the term/phrase matches terms in more than one term cluster.

**16. (Canceled)**

**17. (Previously presented)** The computer-readable data storage medium of claim 15, and wherein the entity is a computer-program application and/or an end-user.



**18. (Previously presented)** The computer-readable data storage medium of claim 15, further comprising computer-executable instructions for determining the calculated similarity as follows:

$$\text{sim}(q_j, q_k) = \sum_{i=1}^d w_{ij} \cdot w_{ik} ;$$

wherein  $d$  represents vector dimension,  $q$  represents a query,  $k$  is a dimension index, and wherein weight  $w$  for the  $i^{\text{th}}$  vector's  $j^{\text{th}}$  term is calculated as follows:

$$w_{ij} = TF_{ij} \times \log(N / DF_j) ; \text{ and}$$

wherein  $TF_{ij}$  represents term frequency,  $N$  is a total number of query terms, and  $DF_j$  is a number of extracted feature records that contain term  $j$ .

**19. (Previously presented)** The computer-readable data storage medium of claim 15, further comprising computer-executable instructions for:

collecting historic query terms from a query log; and

determining ones of the historic query terms with a high FOO.

**20. (Previously presented)** The computer-readable data storage medium of claim 15, before creating the term clusters, further comprising computer-executable instructions for:

reducing dimensionality of the term vectors; and

normalizing the term vectors.

**21. (Previously presented)** The computer-readable data storage medium of claim 15, wherein evaluating further comprises computer-executable instructions for:

identifying a match between the term/phrase and term(s)/phrase(s) from one or more term clusters; and

responsive to identifying, generating related term suggestion(s) comprising the term(s)/phrase(s).

**22. (Previously presented)** The computer-readable data storage medium of claim 21, wherein the related term suggestion(s) further comprise for each term/phrase of the term(s)/phrase(s), a frequency of occurrence value indicating a number of times the term/phrase occurs in a set of mined historical queries.

**23. (Previously presented)** The computer-readable data storage medium of claim 15, wherein generating the term clusters further comprises computer-executable instructions for:

sending respective ones of the high FOO historical queries to the search engine to obtain the search results;

extracting features from at least a subset of search results corresponding to the respective ones; and

producing term vectors from the features as a function of term and inverted document frequencies.

**24. (Previously presented)** The computer-readable data storage medium of claim 23, and wherein the features comprise a title, description, and/or context for the respective ones of the high FOO historical query terms.

**25. (Previously presented)** The computer-readable data storage medium of claim 23, and wherein the respective ones comprise top ranked ones of the search results.

**26. (Previously presented)** The computer-readable data storage medium of claim 15, wherein the term clusters are a first set of term clusters, and wherein the computer-executable instructions further comprise instructions for:

determining that there is no match between the term/phrase and the terms/phrases;  
and

responsive to the determining:

making a second set of term clusters from calculated similarity of term vectors, each term vector being generated from search results associated with a set of low FOO historical queries previously submitted to the search engine; and

evaluating the term/phrase in view of terms/phrases of the second set of term clusters to identify one or more related term suggestions.

**27. (Previously Presented)** The computer-readable data storage medium of claim 26, wherein making further comprises computer-executable instructions for:

identifying the low FOO historical queries from historical queries mined from a query log;

sending respective ones of at least a subset of the low FOO historical queries to the search engine to obtain search results;

extracting features from at least a subset of search results; and

producing the term vectors from the features as a function of term and inverted document frequencies.

**28. (Previously presented)** The computer-readable data storage medium of claim 27, and further comprising computer-executable instructions, after clustering, for:

determining that there is no match between the term/phrase and term(s)/phrase(s) from the first set of term clusters, the first set being based on high FOO historical queries; and

responsive to the determining, identifying a match between the term/phrase and term(s)/phrase(s) from one or more of the second set of term clusters, the second set being based on low FOO historical queries; and

responsive to identifying, generating related term suggestion(s) comprising the term(s)/phrase(s).

**29. (Currently Amended)** A computing device comprising:

a processor; and

a memory coupled to the processor, the memory comprising computer-program instructions executable by the processor for:

mining search results via a multi-sense query, wherein the multi-sense query comprises:

determining terms/phrases semantically related to submitted terms/phrases, wherein semantic relationships are discovered by mining a context of the term/phrases to determine meaning;

configuring a threshold frequency of occurrence (FOO) value;

assigning historical queries to high FOO or low FOO based on the configured threshold value;

generating term vectors from the search results associated with a set of high FOO historical queries previously submitted to a search engine; and  
generating term clusters as a function of calculated similarity of term vectors;

generating term clusters as a function of calculated similarity of term vectors, each term vector being generated from search results associated with a set of high frequency of occurrence (FOO) historical queries previously submitted to a search engine; and

responsive to receiving a term/phrase from an entity, evaluating the term/phrase via the multi-sense query in view of terms/phrases in the term clusters to identify one or more related term suggestions, wherein the identifying is based on a combination of FOO and a confidence value; and

returning at least one suggested term list ordered by the combination of FOO and confidence value, wherein multiple suggested term lists are generated when the term/phrase matches terms in more than one term cluster.

**30. (Cancelled)**

**31. (Previously presented)** The computing device of claim 29, and wherein the entity is a computer-program application and/or an end-user.

**32. (Previously presented)** The computing device of claim 29, further comprising computer-executable instructions for determining the calculated similarity as follows:

$$\text{sim}(q_j, q_k) = \sum_{i=1}^d w_{ij} \cdot w_{ik} ;$$

wherein  $d$  represents vector dimension,  $q$  represents a query,  $k$  is a dimension index, and wherein weight  $w$  for the  $i^{\text{th}}$  vector's  $j^{\text{th}}$  term is calculated as follows:

$$w_{ij} = TF_{ij} \cdot \log(N / DF_j) ; \text{ and}$$

wherein  $TF_{ij}$  represents term frequency,  $N$  is a total number of query terms, and  $DF_j$  is a number of extracted feature records that contain term  $j$ .

**33. (Previously presented)** The computing device of claim 29, further comprising computer-executable instructions for:

collecting historic query terms from a query log; and

determining ones of the historic query terms with a high FOO.

**34. (Previously presented)** The computing device of claim 29, before creating the term clusters, further comprising computer-executable instructions for:

reducing dimensionality of the term vectors; and

normalizing the term vectors.

**35. (Previously presented)** The computing device of claim 29, wherein evaluating further comprises computer-executable instructions for:

identifying a match between the term/phrase and term(s)/phrase(s) from one or more term clusters; and

responsive to identifying, generating related term suggestion(s) comprising the term(s)/phrase(s).

**36. (Previously presented)** The computing device of claim 35, wherein the related term suggestion(s) further comprise for each term/phrase of the term(s)/phrase(s), a frequency of occurrence value indicating a number of times the term/phrase occurs in a set of mined historical queries.

**37. (Previously presented)** The computing device of claim 29, wherein generating the term clusters further comprises computer-executable instructions for:

sending respective ones of the high FOO historical queries to the search engine to obtain the search results;

extracting features from at least a subset of search results corresponding to the respective ones; and

producing term vectors from the features as a function of term and inverted document frequencies.

**38. (Previously presented)** The computing device of claim 37, and wherein the features comprise a title, description, and/or context for the respective ones of the high FOO historical query terms.

**39. (Previously presented)** The computing device of claim 37, and wherein the respective ones comprise top ranked ones of the search results.



**40. (Previously presented)** The computing device of claim 29, wherein the term clusters are a first set of term clusters, and wherein the computer-executable instructions further comprise instructions for:

determining that there is no match between the term/phrase and the terms/phrases;  
and

responsive to the determining:

making a second set of term clusters from calculated similarity of term vectors, each term vector being generated from search results associated with a set of low FOO historical queries previously submitted to the search engine; and

evaluating the term/phrase in view of terms/phrases of the second set of term clusters to identify one or more related term suggestions.

**41. (Previously Presented)** The computing device of claim 40, wherein making further comprises computer-executable instructions for:

identifying the low FOO historical queries from historical queries mined from a query log;

sending respective ones of at least a subset of the low FOO historical queries to the search engine to obtain search results;

extracting features from at least a subset of search results; and

producing the term vectors from the features as a function of term and inverted document frequencies.

**42. (Previously presented)** The computing device of claim 41, and further comprising computer-executable instructions, after clustering, for:

determining that there is no match between the term/phrase and term(s)/phrase(s) from the first set of term clusters, the first set being based on high FOO historical queries; and

responsive to the determining, identifying a match between the term/phrase and term(s)/phrase(s) from one or more of the second set of term clusters, the second set being based on low FOO historical queries; and

responsive to identifying, generating related term suggestion(s) comprising the term(s)/phrase(s).

**43. (Currently Amended)** A computing device comprising:

means for mining search results via a multi-sense query, wherein the multi-sense query comprises:

means for determining terms/phrases semantically related to submitted terms/phrases, wherein semantic relationships are discovered by mining a context of the term/phrases to determine meaning;

means for configuring a threshold frequency of occurrence (FOO) value;

means for assigning historical queries to high FOO or low FOO based on the configured threshold value;

means for generating term vectors from the search results associated with a set of high FOO historical queries previously submitted to a search engine; and

means for generating term clusters as a function of calculated similarity of term vectors;

~~generating means to generate term clusters as a function of calculated similarity of term vectors, each term vector being generated from search results associated with a set of high frequency of occurrence (FOO) historical queries previously submitted to a search engine; and~~

responsive to receiving a term/phrase from an entity, ~~evaluating means for to evaluate~~ evaluating the term/phrase via the multi-sense query in view of terms/phrases in the term clusters to identify one or more related term suggestions, wherein the identifying is based on a combination of FOO and a confidence value; and

means for returning at least one suggested term list ordered by the combination of FOO and confidence value, wherein multiple suggested term lists are generated when the term/phrase matches terms in more than one term cluster.

**44. (Canceled)**

**45. (Previously presented)** The computing device of claim 43, and wherein the entity is a computer-program application and/or an end-user.

**46. (Previously presented)** The computing device of claim 43, and further comprising:

collecting means to collect historic query terms from a query log; and

determining means to determine ones of the historic query terms with a high FOO.

**47. (Previously presented)** The computing device of claim 43, wherein the evaluating means further comprise:

identifying means to identify a match between the term/phrase and term(s)/phrase(s) from one or more term clusters; and

responsive to identifying, generating means to generate related term suggestion(s) comprising the term(s)/phrase(s).

**48. (Previously presented)** The computing device of claim 43, wherein the generating means to generate the term clusters further comprise:

sending means to send respective ones of the high FOO historical queries to the search engine to obtain the search results;

extracting means to extract features from at least a subset of search results corresponding to the respective ones; and

producing means to produce term vectors from the features.

**49. (Original)** A computing device as recited in claim 43, wherein the term clusters are a first set of term clusters, and wherein the computing device further comprises:

determining means to determine that there is no match between the term/phrase and the terms/phrases; and

responsive to the determining:

making means to make a second set of term clusters from calculated similarity of term vectors, each term vector being generated from search results associated with a set of low FOO historical queries previously submitted to the search engine; and

evaluating means to evaluate the term/phrase in view of terms/phrases of the second set of term clusters to identify one or more related term suggestions.

**50. (Previously presented)** The computing device of claim 49, and further comprising:

calculating means to calculate that there is no match between the term/phrase and term(s)/phrase(s) from the first set of term clusters, the first set being based on high FOO historical queries; and

responsive to the calculating, identifying means to identify a match between the term/phrase and term(s)/phrase(s) from one or more of the second set of term clusters, the second set being based on low FOO historical queries; and

responsive to identifying, generating means to generate related term suggestion(s) comprising the term(s)/phrase(s).